



Switching To Aqueous Parts Cleaning

Ecology Fact Sheet

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Why Switch?

Many solvent users are seeking alternative methods for **parts cleaning and surface preparation**. Regulatory and economic pressures stemming from the environmental and health effects of parts cleaning systems have lead to a search for less hazardous cleaners. Many companies have already converted to aqueous (water based) cleaning systems to reduce costs and regulatory requirements while reducing the liability of waste, air emissions, and worker safety.

At one Washington defense facility, a freon vapor degreaser unit was replaced with an aqueous cabinet washer. The investment paid for itself in two months, and will save more than \$65,400 a year. An irrigation system manufacturer in Eastern Washington is saving over \$13,000 a year after replacing its vapor degreaser with a detergent system, which paid for itself in less than 4 years.

Considerations In Selecting An Aqueous Cleaner

A good aqueous cleaner has a balance of the following properties:

- ✓ complete water solubility
- ✓ separates from soil
- ✓ does not re-deposit soil
- ✓ corrosion protection
- ✓ controls foam
- ✓ non-chelated
- ✓ backed by good vendor service
- ✓ hard water tolerance
- ✓ good soil load capability
- ✓ free-rinsing
- ✓ non-polluting (sewer discharge)
- ✓ solution stability
- ✓ buffering

A variety of aqueous cleaning options exist to address different contaminants such as those that are inorganic (scale, rust, grit, dust) and organic (oils, grease, flux).

Aqueous Chemistry	For These Contaminants
water water and alcohol acidic emulsions saponifiers alkaline	inorganic contaminants inorganic contaminants rust and scale organic and inorganic oils, greases, and rosin organic and inorganic

Aqueous cleaners may include corrosion and etching inhibitors, wetting agents, builders, and emulsifiers. Some also contain solvents you may be trying to eliminate. Common additive solvents are 2-butoxy ethanol (butyl cellosolve), ethylene or propylene glycol ethers, terpenes, N-methyl pyrrolidone, dibasic esters, and alcohols. Refer to the product's MSDS or manufacturer for more information. EPA Test Method 8240 can be used to detect the presence of solvents that are volatile organic compounds (VOCs). For more information, call the Department of Ecology.

Optimizing Your Aqueous Cleaning System

Aqueous cleaning performance is affected by the following variables:

- ✓ pH—can effect cleaning performance or cause etching or corrosion.
- ✓ Agitation—too little agitation can result in poor cleaning; too much can result in excessive foam and aeration.
- ✓ Concentration—too little can lead to poor cleaning, reduced tank life, reduced cost effectiveness; too much can affect solubility, attack the part, or cause poor rinsing.
- ✓ Cleaning time—too little can cause poor cleaning and rinsing; too much can slow production or cause the part to be attacked.
- ✓ Temperature—too low can cause poor cleaning or rinsing; too high can lead to higher operating cost, damage to the part, undesirable drying, degradation of the cleaner.

Changing rust protectants, lubricants, or metal working fluids “upstream” of your cleaning process can make parts cleaning easier. Cleaning can also be reduced or eliminated through these measures:

- ✓ Modify upstream/downstream processes to avoid or reduce need to clean.
- ✓ Use greaseless or water-based binders for buffing.
- ✓ Reduce the entry of tramp oils into machine coolants and cut oils.
- ✓ Reduce contamination during storage, transport, and handling.
- ✓ Specify that parts are delivered to your shop clean.
- ✓ Reduce the number of times a part is cleaned.
- ✓ Switch to lubricants or coolants that are more easily cleaned by your system

Your aqueous cleaning system may benefit from the following optimization measures:

- ✓ Pre-clean parts to remove heavy contamination and increase cleaner life. A dirtier, “sacrificial” cleaning tank might be used before the main cleaning operation.
- ✓ Monitor the cleaner's cleaning ability prior to replacing: when is it really too spent to perform adequately?
- ✓ Remove sludge and oils on a routine basis.
- ✓ Refurbish your cleaner to extend its useful life.
- ✓ Keep tanks and containers closed and labeled.
- ✓ Reduce drag-out of cleaner through proper racking and withdrawal rate.
- ✓ Optimize heat, agitation, retention time, etc..
- ✓ Pretreat water to remove minerals.
- ✓ Use rinse water for makeup in aqueous baths.

Rinsing and often drying are necessary for high performance aqueous cleaning. Because of this, aqueous systems often require more floor space. A number of drying methods are available, such as air dry, flash dry (with very hot water and slow withdrawal), forced air, air knives, infrared, convection ovens, hot nitrogen, and centrifugal.

Extending Cleaner Life*

Extending the life of your aqueous cleaner can save you money. Companies selecting a new aqueous cleaning system should consider treatment and recycling options early in the selection process. Closed-loop reuse of cleaner can save on purchase and disposal costs.

Contaminants such as oils, metal cuttings, suspended or dissolved solids, and ions such as sodium or chloride can degrade the quality of the cleaner. Preventing the build-up of these substances will allow you to use the cleaner much longer before it must be disposed. As the life of the cleaner is extended, the active ingredients might need to be re-added to strengthen the cleaning solution.

The first step in extending cleaner life is to identify the primary contaminants. If it is oil, is it non-emulsified, or is it mechanically or chemically emulsified? Is it salts, rust, scale, or metals? Some vendors will conduct tests to determine the contaminants in your cleaner.

The second step is to reduce sources of contamination where possible. Some contaminants, such as metal-working fluids, dust, or finger prints, can be reduced at the source, through operating changes or increased care in handling. Changing rust protectants or metal working fluids can make recycling of the cleaner easier.

Third, consider maintaining the cleaner with a contaminant removal system. Such systems can be centrally located, or dedicated to specific cleaning lines. Settling or filtering can help to remove solids and free (non-emulsified) oils. Skimming can remove free oils. Plate separators, coalescing units, and gravity separators may be able to remove free or mechanically-emulsified oils. Membrane technologies such as ultrafiltration or microfiltration are more expensive, but can remove all types of oil (as well as some components of the cleaner itself).

* Adapted from *Extending the Life of Aqueous Cleaning Solutions*, by the Office of Pollution Prevention, Ohio Environmental Protection Agency. Available by telephoning (614) 644-3469 or writing to the Office of Pollution Prevention, Ohio Environmental Protection Agency, P.O. 1049, Columbus, OH 43216-1049.

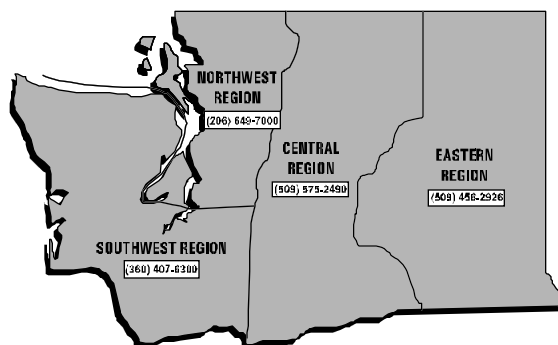
Disposing of Aqueous Cleaners

If a spent aqueous cleaner is to be discharged to a sewer, contact your local sewer authority about limits on oils, BOD, and any metals or toxics originating from the soils removed from the parts. It may be necessary to pretreat the cleaner before discharging.

Many aqueous cleaners contain added emulsifiers. Ideally, an emulsion removes and captures oils, then “breaks” fairly quickly to free oils for removal. If an emulsion cleaner does not break quickly enough, it will render oil/water separators ineffective and possibly clog sewage pipes and treatment facilities. The time it takes for a bucketful of spent emulsion to break will indicate how an emulsion may behave when disposed. Compare this time to the retention time of your oil/water separator or other oil capture device (maximum flow divided by the volume of the separation device).

For More Information

Ecology has experienced Pollution Prevention Consultants available to advise you on solvent substitution techniques and issues. They can provide information over the telephone, or make educational (non-enforcement) visits your work site to provide free technical assistance on solvent substitution, economic considerations, pollution prevention opportunities, and suppliers. Use the regional phone numbers below to ask for a Toxics Reduction Specialist.



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If you have special accommodation needs or require this document in alternative format, please contact the Hazardous Waste and Toxics Reduction Program at (360) 407-6700 (voice) or (360) 407-6006 (TDD).

Ecology's telecommunications device for the deaf (TDD) number is (360) 407-6006. Regional TDD numbers are:

CRO (TDD) (509) 454-7673
ERO (TDD) (509) 458-2055

NWRO (TDD) (206) 649-4259
SWRO (TDD) (360) 407-6306

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